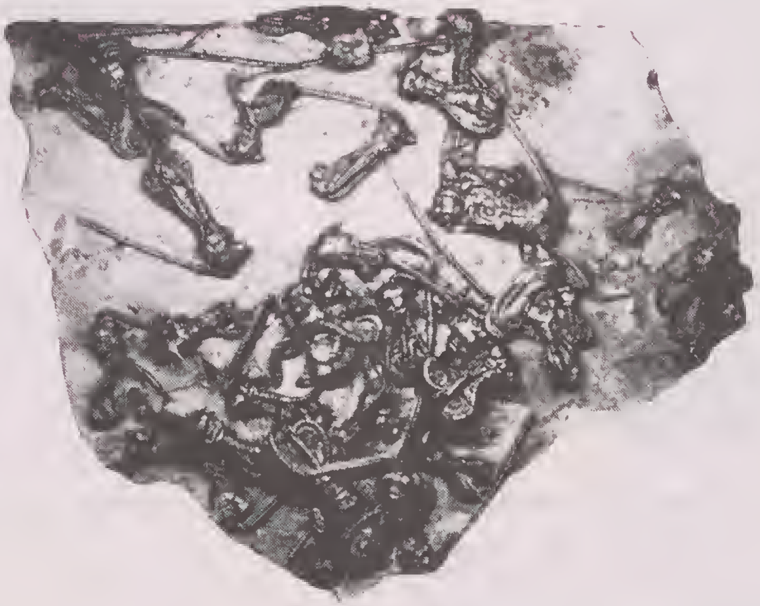
THE FOSSIL COLLECTOR

BULLETIN No 36 JANUARY 1992



Jimbacrinus bostocki Teichert 1953
(refer page 5)

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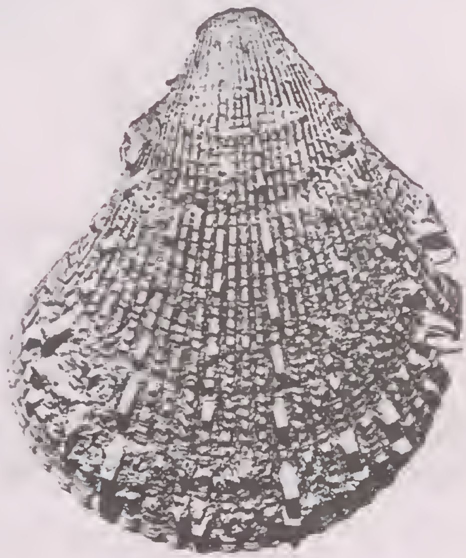
EDITORIAL

No doubt the most talked about subject in the Australian palaeontological community during 1991, has been the revelation of the illegal export of fossils on a very large scale. Thanks to the Commonwealth Police, details of this activity are included in the following pages together with a synopsis of the relevant legislation covering our movable cultural heritage. We are happy to report that the persons currently under investigation are not members of our Association, although they could quite easily have been, since our function is simply to publish a magazine which anyone can obtain on payment of the annual subscription.

On a much more positive note, we are pleased to report, albeit somewhat belatedly that our Bulletin "The Fossil Collector" is included in the list of serials scanned for items of relevance for inclusion in the Zoological Record, an annual bibliography of the world's zoological literature which is published jointly by BIOSIS and the Zoological Society of London.

Bep Schekkerman, our Western Australian representative, is to be congratulated on having a Mesozoic bivalve, Spondylus schekkermanae, named in her honour in the recently published paper by T. A. Darragh and G. W. Kendrick (1991), "Maastrichtian Bivalvia (excluding Inoceramidae) from the Miria Formation, Carnarvon Basin, north western Australia. Records of the Western Australian Museum, Supplement 36". Bep found the specimen in the Giralia Ranges in 1985 and subsequently donated it to the Museum (see illustration on the right).



Subscriptions for the 1992/93 financial year are due on March 1st (renewal form enclosed). Payment before the middle of April would be appreciated to avoid the expense of sending out reminder notices.

Once again we have no articles in reserve or even promised for our next issue, a fact which gives the Editor sleepless nights!

Any material for the next issue should be submitted by 15th April, 1992, unless otherwise agreed.

Frank Holmes

FINANCES

Statement of finances as at 15th January, 1991:

Carried forward from previous year	$ 2157.73
Add income 1.3.1991 to 15.1.1992	$ 1032.90
	$ 3190.63
Less expenditure 1.3.1991 to 15.1.1992	$ 1473.84
	$ 1716.79
Deduct advance subscriptions	$ 144.61
Balance in hand (excluding cost of this Bulletin)	$ 1572.18

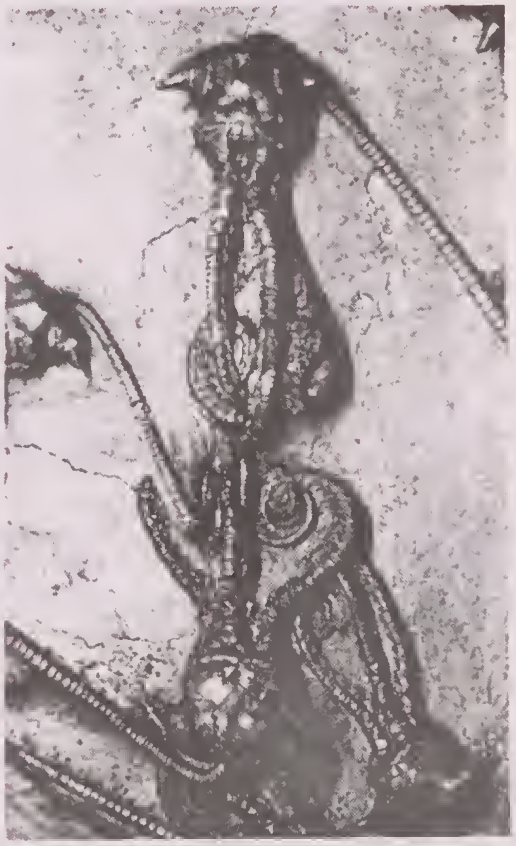
1992/93 SUBSCRIPTIONS

As our current reserves are still more than adequate for our needs, we have again decided not to increase the standard fee for the coming financial year (March 1st, 1992 to February 28th, 1993); however, because of rises in overseas postage, other subscriptions have risen marginally.

Surface Mail	
Australia and New Zealand	$ 7.50
All other countries	$ 9.00
Air Mail	
New Zealand	$ 10.00
USA/Canada	$ 12.50
UK/Europe	$ 14.00

(All subscriptions are quoted in Australian dollars)

NEW FOSSIL PURCHASE BY MUSEUM OF VICTORIA



The Museum of Victoria has recently purchased, for future display, a magnificent plate of crinoids from the Carnarvon Basin, Western Australia

The slab measuring approximately 56cm x 41cm contains almost 50 calyxes of the Early Permian (Artinskian) crinoid *Jimbacrinus bostocki* Teichert 1954, with arms and stems intact.

The quality of the preservation is excellant, as can be seen by the photograph on the front page of this issue and the enlargements of sections of the slab illustrated above.

The genus *Jimbacrinus* Teichert 1954, together with the genus *Calceolispongia* Etheridge 1915, form the family Calceolispongiidae within the order Cladida, subclass Inadunata. Among all cladid inadunates most weird examples of aberrant specialization are found among this family, the basals of which were originally misidentified as sponges, hence the name Calceolispongiidae.

Reference:

Teichert, C., 1954. A new Permian crinoid from Western Australia. Journal of Paleontology 28(1), 70-75, pls 13-14.

ILLEGAL EXPORT OF AUSTRALIAN FOSSILS

Commander D. McCulloch, Australian Federal Police, Officer in Charge, Central Region, Unley, South Australia.

The F.C.A.A., is indebted to Commander McCulloch for providing, in a letter dated 5th December, 1991, the following detailed information concerning the alleged illegal export of Australian fossils brought to light by the theft of a specimen of the rare Ediacaran seapen, Charniodiscus arboreus, from the Flinders Ranges National Park (Bulletin 35, page 4).

Australian Federal Police detectives in Adelaide are currently investigating the alleged illegal export and the attempted export of fossils from Australia, some up to 600 million years old.

The export of fossils from Australia without a permit is prohibited under section 9(3) of the Commonwealth Protection of Movable Cultural Heritage Act 1986. The maximum penalty for offences under this Act is a $100,000 fine or imprisonment for five years, or both.

Following a request for investigation from the Cultural Heritage Branch of the Department of Arts, Sport, The Environment, Tourism and Territories, the AFP began enquiries into the alleged theft of fossils from the Flinders Ranges National Park.

It was alleged that an Ediacaran Fossil, known as a seapen and which is one of the first known examples of marine life as it occurred on earth up to 600 million years ago, had been removed.

Estimates of its value vary, but figures of up to A$600,000 have been suggested as a price that might be paid by either collectors or museums on the overseas black market.

Inquiries conducted by the Australian Federal Police, with the assistance of the Australian Customs Service, Interpol and the South Australia and other museums, resulted in the identification of a number of suspects.

The Tokyo Metropolitan Police, through Interpol, and the Australian Embassy in Tokyo, are assisting the AFP in identifying and locating fossils allegedly removed from Australia.

The AFP investigation also identified further sites in South Australia and Western Australia where fossils had been removed.

In late October, the Australian Customs Service in Perth intercepted a suspect allegedly attempting to smuggle fossils out of the country. A number of fossils were seized which police believe were intended for sale on overseas markets.

During the past few weeks, Federal Police from Adelaide have travelled to destinations in WA and SA. In all, 13 search warrants were executed by Federal Police on residential and business addresses.

These searches resulted in hundreds of fossils being seized, with a gross weight of approximately 300kg.

Palaeontologists from South and Western Australian museums have identified most of the fossils seized as :-

More than 400 specimens of Devonian Fish Fossils. These fossils would probably represent the best preserved Palaeozoic fish remains (250 to 600 million years old) anywhere in the world. These fish have revolutionised scientific theory on the evolution of fish.

Opalised crinoids - ancient relatives of starfish and sea urchins having been preserved in precious opal. These fossils are magnificent examples of life during the Cretaceous period (110 million years ago).

Ediacaran Fauna - found in the Flinders Ranges, these fossils are the most widely recognised claim to fame for South Australia. They are the first glimpse of marine animals in the long history of life on earth and are the oldest known complete animal fossils in the world.

Trilobites - they are part of the early Cambrian deposits (560 million years old) and represent preservation of organisms found only at a few other localities in the world. The site from which they were taken is one of international significance to science.

Australian Federal Police are continuing their investigations and are hopeful of having returned to Australia other fossils that may have been illegally exported.

The AFP will refer a brief of evidence to the Director of Public Prosecutions for consideration as to what charges may be laid against the suspects.

[A synopsis of the Commonwealth PROTECTION OF MOVABLE CULTURAL HERITAGE ACT 1986, including amendments and regulations, is contained in the following article]

PROTECTION OF MOVABLE CULTURAL HERITAGE ACT 1986

As a consequence of the article "Illegal Export of Australian Fossils", the Editor considers it desirable to bring to the attention of readers of this Bulletin the general contents of the above Commonwealth Act of Parliament.

The Protection of Movable Cultural Heritage Act 1986 (No.11 of 1986) is designed not only to protect Australia's heritage of movable cultural objects, as the title indicates, but also to support the protection by foreign countries of their heritage of movable cultural objects.

Consequently the Act applies both within and outside Australia and "binds the Crown in right of the Commonwealth, of each of the States, of the Northern Territory and of Norfolk Island".

Part 11, Division 1 - Exports

Section 7 (1), defines the movable cultural heritage of Australia as "objects that are of importance to Australia, or to a particular part of Australia, for ethnological, archaeological, historical, literary, artistic, scientific or technological reasons".

PROTECTION OF MOVABLE CULTURAL HERITAGE ACT 1986 (Cont.)

While this Section covers a wide range of categories within which the above objects fall, the three which concern fossil collectors are : (a) objects recovered from the soil or inland waters or the sea bed or subsoil beneath the coastal sea or waters above the continental shelf; (g) objects of scientific or technological interest; and (j) any other prescribed categories.

Section 8 requires the regulations made under the Act to include a list, to be known as the "National Cultural Heritage List", of categories of objects which are subject to export control.

Section 9 deals with "Unlawful exports" and lists the penalties for persons convicted of an offence. One important aspect of this section is that an Australian protected object is forfeited if, exported by a person other than in accordance with a permit or is liable to forfeiture in the case of an attempt being made to export such object without a permit. The penalties for conviction of an offence under this section of the Act are for a natural person - a fine not exceeding $100,000 and/or imprisonment for a period not exceeding 5 years, or for a body corporate - a fine not exceeding $200,000.

The remainder of Division 1 covers the application for a permit to export; the granting or otherwise of a permit; certificates of exemption; and variations to permit conditions. Briefly an application for a permit has to be made to the Minister who shall refer it to the National Cultural Heritage Committee (set up under Part 111 of the Act) who in turn shall refer it to one or more expert examiners. On receipt of report from the Committee, the Minister may grant or refuse to grant a permit. In the case of the latter, the reasons for such refusal must be notified to the applicant in writing. Section 13(1) gives the Minister power to impose further conditions to a permit, vary or revoke a condition, or even revoke the permit.

Part 11, Division 2 - Imports

Section 14 covers "Unlawful imports" of protected objects of a foreign country with forfeiture and penalties similar to those for unlawful exports. This Section is of considerable importance to collectors who may quite unwittingly receive specimens that are prohibited exports from an overseas country and then leave themselves open to prosecution.

Part 111 - Administration

Deals primarily with the functions and constitutions of the National Cultural Heritage Committee.

Part 1V - National Cultural Heritage Fund

Sets up a fund for the purpose of facilitating the acquisition of Australian protected objects.

Part V - Enforcement of Act

Covers appointment of Inspectors, search warrants, power to arrest, seizure of protected objects, court proceedings, production of permits, and indictable offences etc.

Part V1 - Miscellaneous

Requires the preparation of an Annual Report; allows for appeals against the Minister's decision to refuse to grant a permit, or to impose a condition; and, gives power to the Governor-General to make regulations.

The Protection of Movable Cultural Heritage Regulations (Amendment)

Statutory Rules 1988 No.194, sets out the categories of objects that form the National Cultural Heritage Control List.

This is made up of thirteen parts as follows :-

1. Objects of Australian Aboriginal Heritage
2. Archaeological Objects
3. Objects of Aboriginal Heritage
4. Archaeological and Ethnographic Objects of Non-Australian origin.
5. Natural Science Objects of Australian Origin
6. Objects of Applied Science or Technology.
7. Military Objects
8. Objects of Decorative Art
9. Objects of Fine Art
10. Books, Records, Documents, Graphic Material & Recordings
11. Numismatic Objects
12. Philatelic Objects
13. Objects of Social History

Each part defines in detail the objects covered by the Regulations, and in several cases specifies the age or current Australian market value by which an object is deemed to be a prohibited export.

The following is an extract of Part V of the above regulations:

PART V—NATURAL SCIENCE OBJECTS OF AUSTRALIAN ORIGIN

1. In this Part:

"holotype" means the original specimen from which the description of a new species is obtained, being a specimen of a palaeontological object or of present-day flora or fauna;

"mineral" includes a carving or sculpture created from any mineral including a polished gemstone but does not include any ore or concentrate used industrially or intended for industrial use;

"palaeontological object" means:

(a) a vertebrate or invertebrate fossil or plant fossil or a trace fossil specimen, not being a fossil fuel or fossiliferous rock used or intended for any use relating to industry;

(b) a carving or a sculpture made from fossiliferous or fossilised matter;

(c) any material, record or thing of scientific significance in relation to palaeontology; and

(d) a precious opal replacement fossil of a vertebrate or invertebrate animal.

2. This category consists of:

(a) any palaeontological object having a current Australian market value of not less than $1,000;

PROTECTION OF MOVABLE CULTURAL HERITAGE ACT 1986 (Cont.)

(b) any mineral not otherwise referred to in this clause having a current Australian market value of not less than $10,000;

(c) any gold nugget having a current Australian market value of not less than $250,000;

(d) any diamond or sapphire having a current Australian market value of not less than $250,000;

(e) any opal having a current Australian market value of not less than $100,000;

(f) any other gemstone having a current Australian market value of not less than $25,000;

(g) any specimen of natural crystal having a current Australian market value of not less than $5,000;

(h) any meteorite or australite; and

(i) any holotype of Australian origin:

  (i) that is not lodged in an overseas collecting institution; or

  (ii) in relation to which a permit or an authority issued under the Wildlife Protection (Regulation of Exports and Imports) Act 1982 is not in force.

An amendment to the Act, contained in the Arts, Tourism and Territories legislation Amendment Act 1990 (No. 88 of 1990), among other matters, allows a principal collecting institution (e.g., a public museum) "to apply to the Minister for a permit to export a Class B object that is accessioned into the collection for which the institution is responsible". A condition of any permit so granted is that the object is exported on loan for the purpose of research, public exhibition or a similar purpose.

The original regulations (Statutory Rules 1987 No. 149) and four other amendments to the regulations (Statutory Rules 1990 No. 116, 1990 No. 293, 1990 No.350 and 1991 No.27) are not related to the content of this synopsis.

COMMENT

The PMCH Act and regulations do not in themselves have any bearing on the collection, or even sale, of Australian fossils within Australia. They are designed primarily to prevent the loss of our valuable cultural heritage to overseas countries.

There have already been comments about the shortcomings of the Act and regulations particularly in the requirement for valuations to be made on a current Australian market value, rather than on the overseas market value where specimens can fetch anything up to ten times their value in Australia. Concern has also been expressed that material of considerable scientific importance could leave the country simply because it would be difficult to prove it had any commercial value within Australia. Perhaps the Act should be amended to ban the export of any undescribed fossil species, although how such a requirement could be enforced is another matter. After all, a section of the old Customs (Prohibited Exports) Regulations prohibited the exportation of [any] fossil material or other geological specimens from Australia unless the consent in writing of the Minister was first obtained and that does not appear to have ever been enforced.

Finally, on the topic of fossil collecting, we should all be aware that the collecting of fossils within National Parks and certain designated reserves is illegal without a written permit.

FOSSIL SPECTACLES, TABLES AND ANCHORS.

Ken Bell, Stony Creek, South Gippsland, Victoria.

Or perhaps you prefer fossil hooks, lyres, ladles and wheels?

These are just some of the fanciful, but descriptive,names given to the various morphological types of holothurian sclerites.

Holothurians, or sea-cucumbers, are soft-bodied marine wormlooking animals which belong to the Echinoderma, Class Holothuroidea. Basically, a typical holothurian is elongate, cylindrical, with a body wall that may be a thin translucent skin or a thick leathery coat but in all cases the body wall is supported by very numerous microscopic calcareous sclerites (sometimes called spicules or ossicles). The anterior or buccal end has an array of tentacles (which are modified tubefeet) surrounding the mouth. In common with other members of the Echinoderma, holothurians show five-fold symmetry although this may be overlaid with an apparent two-fold symmetry due to the living behaviour of the animal. Adults may range in size from several millimetres to greater than one metre. Holothurians are abundant in shallow tropical waters but become less common in similar polar waters, and are to be found at all depths from tidal areas to the deepest waters. Most holothurians are benthic dwellers although one genus, Pelagothuria, leads a pelagic life. Some forms crawl over or through the sea-floor whilst others lead a more or less sessile life attached to rocks or seaweeds, or live in burrows. Some are suspension feeders but for the majority their food consists of decaying organic matter sucked off the seafloor. Holothurians can move by using their tubefeet or, in the case of the apodous forms, by using protruding sclerites to help wriggle along. There is a great variation on this basic plan e.g., forms without tubefeet (apodous), curved forms, varied development of the buccal tentacles, dorsal-ventral flattening - all of which enable biologists to classify the living holothurinid fauna.

The sclerites are microscopic, ranging in greatest dimension between 0.05 mm to about 1 mm. As with other echinoid plates each consist of a single calcite crystal. They differ greatly in shape and as a consequence of their resemblance to common objects are grouped as wheels, anchors, tables, plates etc. (see fig.1).

Unfortunately for palaeontologists, because of their soft bodies, holothurians are rarely preserved as complete specimens or impres-

FOSSIL SPECTACLES, TABLES AND ANCHORS (Cont.)

sions - one exception being several specimens from the Jurassic Solenhofen limestone. However, the calcareous sclerites are to be found in sediments from Devonian time onwards. Several enigmatic fossils in the Ordovician have been referred to as holothurian in origin but it is thought by some that they could equally be plates of ambryonic crinoids. The first fossil sclerite,an anchor, was described by Munster in 1843 from a Jurassic lime-marl found at Streitsburg, Germany. Apart from several major descriptive papers on Carboniferous (Etheridge, 1881; Croneis and McCormack, 1932) and Eocene (Schlumberger, 1888, 1890) faunas late last century and early this one, little systematic work on their taxonomy, distribution or stratigraphic usefulness has been done (although numerous passing mentions have been made of their occurrences) until Frizzell and Exline (1955a,b) attempted a classification of the fossil sclerites.

It is unfortunate that the different types of sclerites are not necessarily characteristic of species or genera. A species may have 2 or 3 different sclerite forms within its body, while the same basic sclerite shape may occur in unrelated genera and species. Frizzell and Exline (1955b) erected 9 families for fossil sclerites based upon their general form e.g., hooks - Achistridae; anchors - Calcancoridae; wheels - Theeliidae; and oval plates, perforated dentate, with a socket at the small end - Synaptitidae. The nine families included 25 genera and 128 species.

Stratigraphically, most faunas other than those from the Carboniferous and Jurassic systems (see table) are ill-known due to lack of study. From the little that is known it seems as if the Carboniferous and Jurassic periods were intervals of rapid holothurian evolution as new sclerite forms appear during these times.

Fossils have been found most frequently in clays, marls and shales, less often in limestones or marly limestones and rarely in sandstones or greensands although those from the greensands are usually very well preserved. It is generally considered that the sclerites were deposited relatively close to the living environment, although dead complete animals could be moved by bottom currents and deposited elsewhere. Upon decomposition of the body the sclerites drop and are then either transported separately or remain as an accumulation.

Techniques for finding fossil sclerites

As most of the fossil sclerites are fragile, care must be taken in freeing them from the matrix. Normal crushing and boiling will destroy most of them. It is better to soak the sample in water for several days with a small amount of dispersant added (bicarbonate of soda, 'Calgon' etc.). Then, when washed, a method of double decanting is used - decant from a large bowl into a

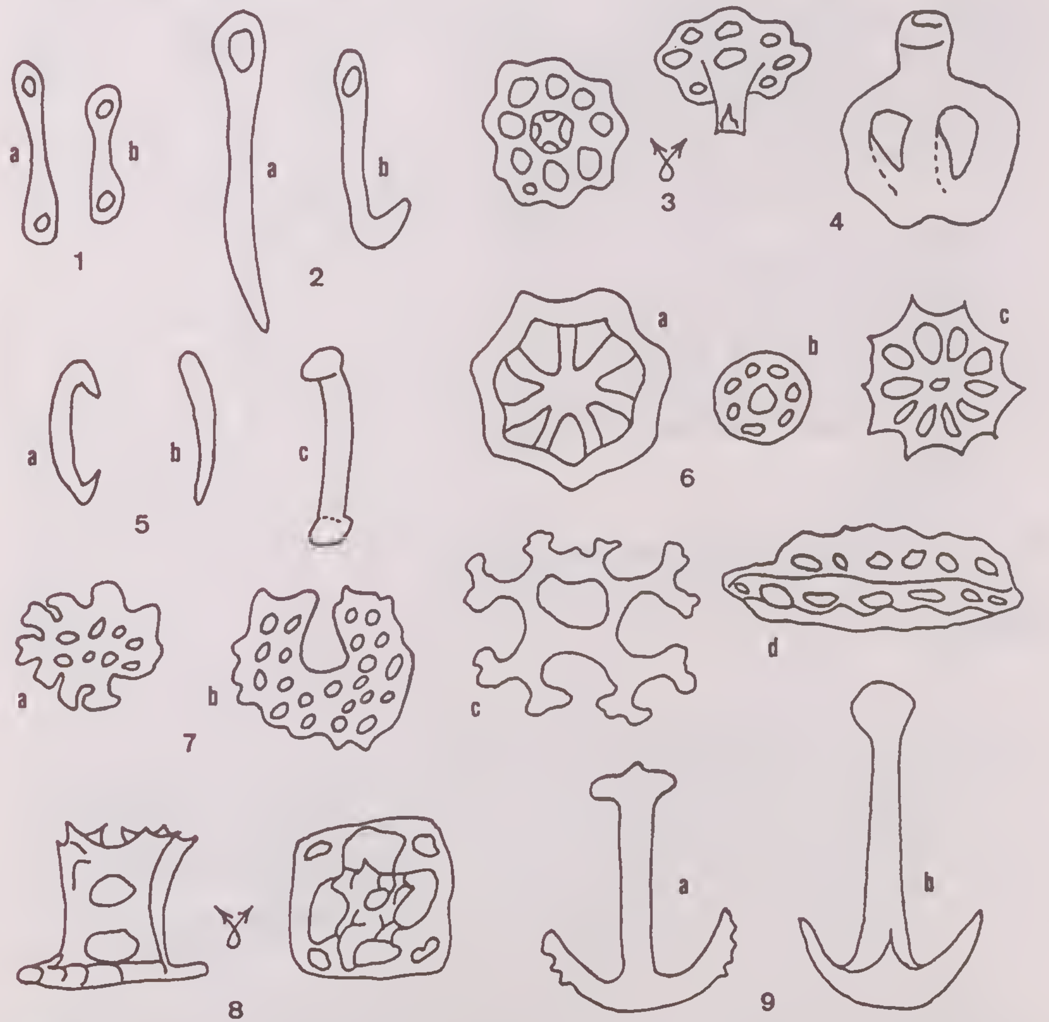


FIGURE 1.
1a & b, spectacles; 2a & b, hooks; 3, table; 4, lyre; 5a, b & c, rods; 6a, b & c, wheels; 7a, b, c & d, plates; 8, table; 9a & b, anchors [from various authors and to different scales].

FOSSIL SPECTACLES, TABLES AND ANCHORS (Cont.)

second container, pouring to waste only the finest particles from the second container; even a third bowl may be used to collect the smallest and finest wheels. Most of the fauna is retained in the initial container. The dry samples may be then gently hand sieved, picked and sorted and placed on microslides for storage and study.

Although I have not searched exhaustively for these sclerites, specimens of rods, anchors and varied plates have been found in many of the Victorian Tertiary deposits. It would seem that this is a wide open field for research.

Stratigraphical distribution of sclerites (from Frizzell & Exline, 1955b).

	Families	Genera	Species
Devonian	3	3	3
Carboniferous	5	8	23
Permian	3	4	6
Triassic	4	4	5
Jurassic	7	18	52
Cretaceous	2	3	3
Paleocene	?	?	?
Eocene	5	8	31
(almost entirely from one French locality!)			
Miocene*	3	3	?
Pliocene*	1	1	1
Pleistocene*	1	2	2

* all compared to Recent species and genera.

References

Croneis, C. and McCormack, J., 1932. Fossil Holothuroidea. Jour. Paleont. 6, 111-148, 6 pl.

Frizzell, D.L. and Exline, H., 1955a. Micropaleontology of holothurian sclerites. Micropaleontology 1: 335-342.

Frizzell, D.L. and Exline, H., 1955b. Monograph of Fossil Holothurian Sclerites. Univ. Missouri, School of Mines and Metallurgy, Bulletin, Technical series No.98: 204 pp., 11 pl. (This is "must" for anyone interested in fossil sclerites - in it are described all the families, genera and known species to 1955. Also is a complete listing of papers dealing with fossil sclerites).

Etheridge, R., 1881. On the presence of the scattered skeletal remains of Holothuroidea in the Carboniferous Limestone series of Scotland. Roy. Soc. Edinburgh. Proc. 6: 183-198, 2 pl.

Munster, G., 1843. Ueber einige Theile fossiler Holothurien im Jura-Kalk von Streitsburg. Beitr. z. Petr.- Kunde, Heft 6: 92-93, pl.4, fig.9.

Schlumberger, C., 1888. Note sur les Holothuridees du Calcaire grossier. Soc. Geol. France, Bull., ser 3. 16: 437-441, 14 figs.

Schlumberger, C., 1890. Seconde note aur les Holothuridees fossiles du Calcaire grossier. ibid. 18: 191-206, 44 figs.

FREDERICK MCCOY

Thomas A. Darragh, Museum of Victoria, Melbourne, Victoria, 3000.

Frederick McCoy (1823-1899) is one of Australia's best known palaeontologists. He described many fossils in the last half of the nineteenth century and taught the first generation of Australian educated palaeontologists. This essay is a modified version of an introductory lecture given at the meeting of the Australasian Association of Palaeontologists held in Melbourne in 1983.

McCoy was born in Dublin the second son of Simon McCoy, a fashionable Dublin physician and professor of materia medica at Queens College, Galway. There is doubt about the date of his birth as some sources give the year as 1817, but McCoy himself claimed to have been born in 1823. If the latter is correct he must have been somewhat of a child prodigy, since he published his first paper on birds 'Remarks on Mr Eyton's arrangement of the Gulls' in the **Magazine of Natural History** in 1838. This birth year may be correct as McCoy stated that it was intended that he follow his father's profession and being a lonely child, spent much of his time studying. It is alleged that he attended medical courses in Dublin but was too young to enrol formally at Dublin University and ended up instead arranging the collections in the Museum of the Geological Society of Dublin in 1839, the year he joined the Society.

The catalogue of the Museum, issued in 1841, has an appendix containing descriptions of new species of fossils. There is no author cited for this, however, McCoy is credited with the arrangement in the introduction to the catalogue and presumably was the author. If this was the case it was his first publication on fossils.

Having been interested in natural history as a youth, McCoy turned towards geology and palaeontology as a profession. In 1841 he was engaged to name and catalogue for sale the shells and fossil remains in the collection of the late Henry Charles Sirr. He also curated the collections of the Royal Dublin Society and those of the Geological Society of Dublin. In November 1842, he applied unsuccessfully for the position of Curator of the Museum of the Geological Society of London.

At about this time Richard Griffith invited McCoy to determine the fossils collected by him and his staff of the Boundary Survey of Ireland. Griffith needed this information to ascertain ages for his Geological Map of Ireland, then in process of compilation.

FREDERICK MCCOY (Cont.)

The results of this work were published in 1844 as **Synopsis of the Carboniferous Fossils of Ireland** and in 1846 as **Synopsis of the Silurian Fossils of Ireland.**

The Geological Survey of Ireland was established in 1845 with Captain Henry James as Local Director under Sir Henry De La Beche, Director General of the Geological Survey of Great Britain and Ireland. The first field staff member to be appointed was McCoy. James had hoped that McCoy could act as palaeontologist to the Survey, but De La Beche wished the fossils collected to be sent to London to be examined by the Survey's palaeontologist, Edward Forbes. Therefore, in May 1845, McCoy was appointed as a Temporary Assistant Geologist on the Survey's mapping program, but his field work left a lot to be desired and he seems to have been better suited to the work of a palaeontologist.

McCoy had feuded with Thomas Oldham at Geological Society meetings in 1846 over the latter's comments on some of McCoy's determinations of Carboniferous fossils and so was put in a difficult position when Oldham succeeded James in July 1846 as Local Director of the Survey. Following Oldham's criticism of his field work, he left the Survey at the end of September 1846.

In November the same year, having come to the attention of Adam Sedgwick of Cambridge University, he was invited to Cambridge for one year (extended to three) to assist in the arrangement of the fossil collection in the Woodward Museum. During his time at Cambridge, McCoy attended lectures in Botany, Chemistry, Medicine and Surgery, but never completed a degree. Even as late as 1852, he intended to take out a medical degree, but never finished the final subjects. It seems that more interesting activities prevented him. Despite this lack

Sir Frederick McCoy Photograph courtesy Geology Department, University of Melbourne

of formal qualifications, his experience and ability were such that he secured the appointment of Professor of Geology, Mineralogy and Palaeontology at Queens College, Belfast in August 1849 and continued to work with Sedgwick during the University vacations.

The palaeontological results of his collaboration with Sedgwick were published in 1852 in a large monograph, **British Palaeozoic Rocks and Fossils**, but Sedgwick's contribution never appeared. As well as his major works, McCoy published about 30 articles between 1845 and 1854 on a variety of subjects but mostly on Palaeozoic fossils. It was probably the influence of Sedgwick that caused McCoy to convert from Roman Catholicism to Anglicanism, and Sedgwick remained a close friend until the latter's death in 1873.

In December 1852 Sedgwick wrote of McCoy :-

> For about five or six years he has been most intimately connected with Cambridge. During three years he entirely lived amongst us, and during the last two or three years he has spent a large portion of each year amongst us carrying on, with almost incredible labour and perseverance, a great scientific work which he has now brought nearly to completion. He was originally destined for the medical profession, and he still I believe, purposes to take a medical degree, for which purposes he has attended a part of our Cambridge course and obtained a certificate to that effect. He is a man of liberal attainments, of cheerful gentleman like manners, and of a tolerant temper and disposition, which enable him to live on terms of familiar friendship with men who widely differ from him in opinion. Thus, altho' he is a Roman Catholic and conforming to the discipline of that church, he has gained the confidence and cordial goodwill of men of all parties in Cambridge. Of course, I now speak of the University of Cambridge in which there are persons of very different and very strong opinions. I am absolutely certain that all the Members of the University, who had the pleasure of his acquaintance, will bear testimony to that which I am here asserting. No man can, I believe, lament more than himself, the intolerance and violence of the extreme religious parties in Ireland. I think this remark important, for of his great attainments as a naturalist and comparative anatomist there can be no doubt, and on these points he can appeal to his published works and obtain most ample testimonials. I believe him to be one of the very best palaeontologists in Europe. No one of my friends (and I have been the Cambridge Professor of Geology for 34 years) has so large an historical knowledge of foreign works on Palaeontology, and no one of my friends has for the last 16 or 17 years, worked so hard with hands and head as he has done, among all parts of the animal kingdom revealed to us in the old world.

By 1854 McCoy was regarded as one of the leading general palaeontologists in England, specialising in the Palaeozoic. With this background, he applied for and was successful in obtaining the position of Professor of Natural Science in the newly established University of Melbourne, arriving in Victoria late in 1854. For convenience McCoy's contribution to Australian and particularly

FREDERICK MCCOY (Cont.)

Victorian palaeontology can be considered under four headings. They are of course interconnected.

University of Melbourne

McCoy taught a host of subjects including botany, chemistry, mineralogy, comparative anatomy, systematic zoology, geology and palaeontology. He was later relieved of chemistry by the appointment of John Drummond Kirkland as lecturer in chemistry in 1865. In 1887 he was also relieved of some biological subjects by the appointment of Professor Baldwin Spencer as Professor of Biology.

The direct effects of his teaching have not yet been investigated, but the intangible effects must have been considerable. Victoria's greatest palaeontologist of the early part of this century, T.S. Hall was one of his students, as was another palaeontologist and later lecturer in geology, G.B. Pritchard. Other students were E.G. Hogg, A.W. Cresswell, Hymen Herman, E.O. Thiele, T.S. Hart and A.S. Kenyon, all of whom made a mark in geology, biology or engineering.

Museum

Though not the founder of the National Museum of Victoria, McCoy was responsible, after his appointment as Director in 1858, for setting it up as a major institution. The museum served as a repository for the collections of the Geological Survey of Victoria particularly fossils. He also purchased large collections of foreign fossils that still remain very useful for comparative purposes in palaeontological research.

Geological Survey

McCoy was appointed Palaeontologist to the Survey in 1856 and continued as such, with some breaks, owing to political circumstances and conditions, until his death. He was a strong supporter of Alfred Selwyn, Director of the Geological Survey, and of the need for a properly organised scientific survey. His direct

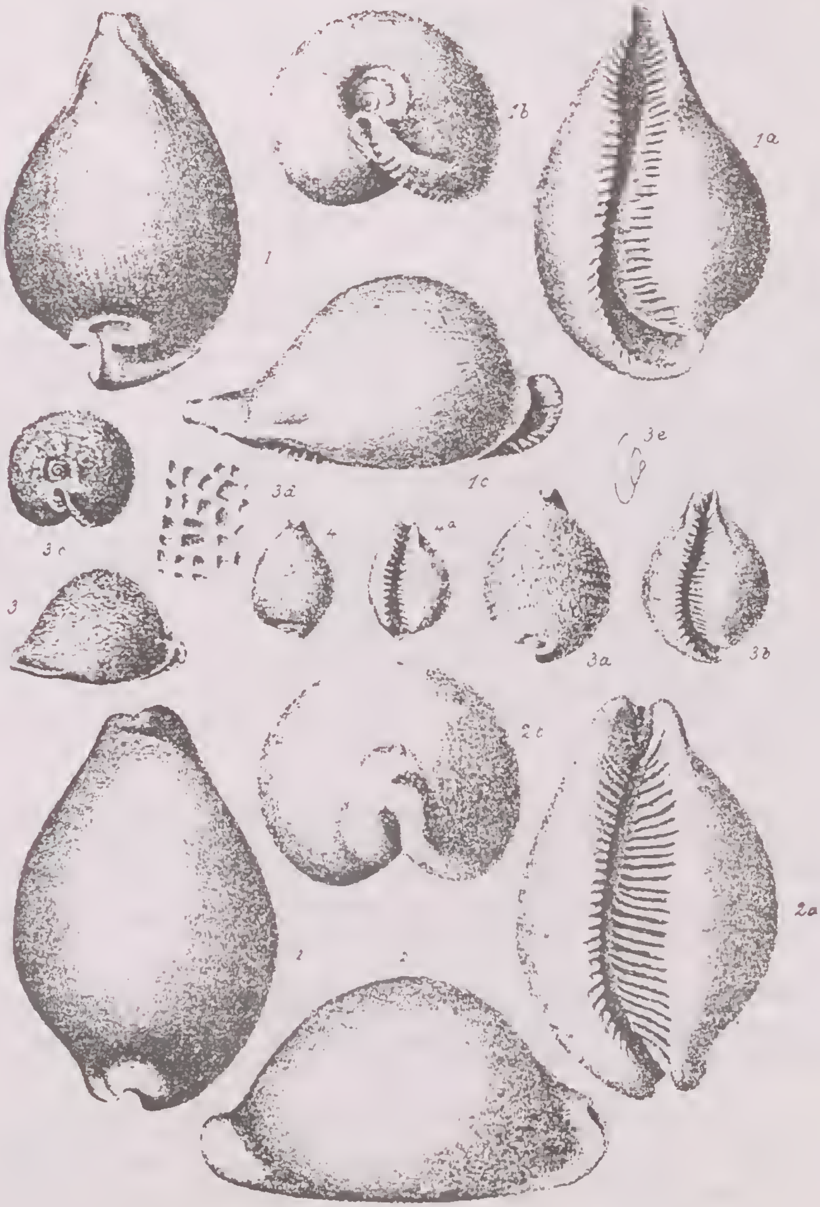
FIGURE 1. (right)
Plate XLIX from McCoy's Prodromus of the Palaeontology of Victoria, Decade 6, 1877.

Fig 1, _Cypraea_ (_Luponia_) _leptorhyncha_ McCoy 1877, from Balcombe Bay; fig.2, _Cypraea_ (_Aricia_) _consobrina_ McCoy 1877, from the Moorabool River; figs 3 & 4, _Cypraea_ (_Luponia_) _contusa_ McCoy 1877, from Balcombe Bay.

[Note: The _Cypraea_ in fig.1 has since been placed by Darragh (1970) in the genus _Rhynchocypraea_; that in fig.2 in the genus _Zoila_; and that in figs 3 & 4 in the genus _Austrocypraea_].

Pl XLIX

PALÆONTOLOGY OF VICTORIA
(Tertiary Mollusca)



A. Bartholomew del et lith Prof. McCoy direxit C Troedel & Co

FREDERICK MCCOY (Cont.)

contribution was to supply fossil determinations (often published on the margins of the maps) and, more particularly, age determinations of the rocks mapped. Both he and Selwyn were surprisingly accurate in their age assignments, considering the context of the time. Many of their assignments held until well into this century before being revised.

Publications

Following on from his appointment as Palaeontologist to the Survey, McCoy was a strong advocate of a series of palaeontological publications modelled on those of the State of New York and on the Decades of the Geological Survey of Great Britain. He was able to convince the government to fund a series of publications originally entitled 'Memoirs of the Museum' to provide descriptions and illustrations of Victorian fossil and living fauna. Work started on this project in 1858 but it was not until 1874 that the first part appeared. This was decade one of the Prodromus of the Palaeontology of Victoria. Unfortunately publication of this work ceased at the seventh decade in 1882, though plates of fossil fish that were unpublished in McCoy's lifetime were later issued in the first Memoir of the National Museum of Victoria in 1906. The series of plates published covered most of the common animal and plant groups known from Victoria. He had plans for describing microfossils, including bryozoans for which he sought Paul MacGillivray's assistance, but these plans came to nothing and MacGillivray's work was eventually published by the Royal Society of Victoria.

McCoy's descriptive work was exhaustive and methodical, and he employed good artists and lithographers to get the best possible illustrations. Not so well known now are the many letters McCoy wrote to newspapers pointing out some scientific matter, giving information, or naming some fossil or animal.

In the 1860's and 1870's he also contributed a series of articles to the Australasian on the zoology of Victoria and on local geology under the nom-de-plume 'Microzoon'.

McCoy also published a number of small papers on fossils, but he never seemed to have had the time from his multifarious official and other activities to research and publish on the huge collection of fossils new to science that were held in the Museum collection. Syntheses of his views on the recent and fossil fauna

were published by William Fairfax in the Australasian Handbook (1859) and in exhibition essays published in connection with the exhibitions of 1861 and 1866.

As a person, McCoy was very genial,kind and charming, though somewhat naive when it came to dealing with government officials and politicians. He was supportive of his staff and well-liked by his students. He was a very knowledgeable scientist, but very dogmatic once he had come to a conclusion on some matter. This dogmatism led him into trouble in two particularly controversial matters - the age of the Australian coalfields and the diminution of the yield of gold with depth.

As early as 1847, McCoy had studied a collection of fossils from the coalfields of New South Wales and Tasmania sent to Cambridge by W.B. Clarke. McCoy determined that these fossils were Mesozoic, a view he continued to hold when he came to Melbourne. This view was strengthened in his mind when he examined fossils from Victoria. He determined that the rocks from which the Victorian fossils came were Mesozoic and assumed that they belonged to the same series as those in New South Wales. Clarke in the meantime had gathered new evidence that lead him to believe that the New South Wales coalfields were Palaeozoic.

Neither McCoy nor Clarke realised that they were arguing about two different series of rocks of widely different ages. In the end McCoy was right about the Mesozoic age of the Victorian coal-bearing rocks, and Clarke was right to regard the New South Wales rocks as Palaeozoic. Both scientists did not come out of this controversy very well, because neither was prepared to accept the new evidence of the other but argued from a predetermined position based on outdated data.

The controversy over the gold yield in quartz reefs not only cast McCoy in a very bad light amongst the mining community but caused scientists in general to be treated with contempt by the general public. McCoy accepted the dogma of Roderick Murchison that the yield of gold in quartz reefs would very rapidly fall away as the reef was followed into the earth. Not just content to believe this, McCoy felt obliged to promulgate the theory far and wide, even in the face of evidence that the theory was not correct, to the disgust of those trying to raise capital to work quartz reefs. Long after he had abandoned support for the theory, he was still the butt of jokes concerning his earlier stance.

FREDERICK MCCOY (Cont.)

Family

McCoy married Anna Maria Harrison (1820 - 1886), daughter of Thomas Harrison a London solicitor and Eliza née Coonan, in Dublin in 1843. There were two children, Frederick Henry (1843-1887) and Emily Mary (1845-1891). The family participated in the social life of Melbourne by attending balls and charity events. Emily, who never married, was well known as a worker for charity until her death. Frederick Henry, after a unsuccessful attempt to become a soldier, undertook a law course at Melbourne University, during which time he registered natural history specimens and entered up the registers in the Museum. He became a successful barrister in Laurence, Otago, New Zealand, where he married Ellen Thompson by whom he had eight children. Following the death of his daughter, McCoy had one of his granddaughters, Emily, as a companian for a short time and also a grandson, Frederick Henry, who remained with him until his death. McCoy's descendants still live in New Zealand.

McCoy's health deteriorated during the 1890's. From 1891 he suffered bouts of chronic bronchitis and his lectures were taken over at various periods by T.S. Hall and G.B. Pritchard. Early in 1899 he was confined to bed with influenza from which he never recovered. He died on 13th May, 1899 and was buried in the Brighton Cemetary.

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STUDYING VICTORIAN TERTIARY OSTRACODA

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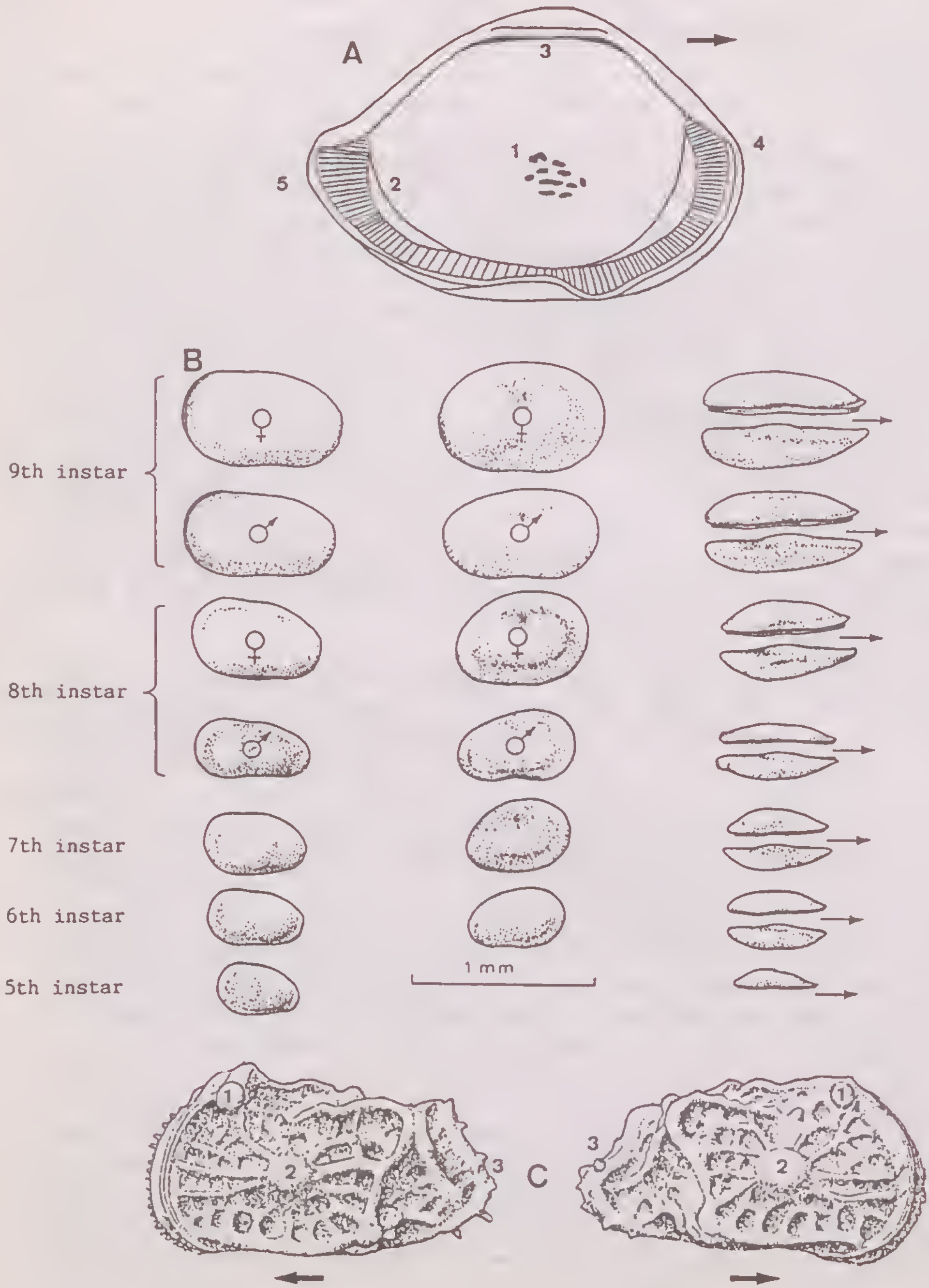
Introduction

Two articles on Victorian Palaeozoic Ostracoda by Steve Eckardt appeared in "The Fossil Collector" in 1987 and 1988, and a brief introductory survey of these interesting microscopic crustaceans was given there, with an emphasis on Palaeozoic forms. This article will focus on Tertiary Ostracoda. The valves or carapaces of living forms of Ostracoda also occur in many marine beach sands, and in estuarine and freshwater deposits. However, in spite of their long and prolific fossil record, and their importance in biostratigraphy and palaeoenvironmental studies, they have not received a great deal of attention in the literature of Victorian fossils. In fact, there is no entry concerning Ostracoda in the indexes of the standard work "Geology of Victoria" edited by Douglas and Ferguson (1988). Victorian Tertiary ostracodes have received increasing attention over the last five or ten years because of the activities of a number of workers, and this will be referred to below.

The study of Ostracoda has taken two directions, which at times have diverged very far from one another. Biologists study living specimens, and concentrate on the soft-bodied animal, its complex structure, morphology and functions. Palaeontologists study the hard parts preserved in the fossil record, namely the valves (shells) and their morphology, ornamentation and structure. The former study is often essential for an understanding by inference of the fossilised hard parts, and recent trends are towards an increasing blend of biological and palaeontological methods. The biologists and the palaeontologists are talking to one another! But fossil species remain generally morphological species determined solely by the morphology of the valves, as is to be expected when the soft parts are almost never preserved in fossils.

Tertiary ostracodes are usually quite well preserved, and the valves or carapaces (two valves preserved joined together) can be separated from the matrix of the rock in which they occur, especially if it is an unconsolidated deposit such as a marl. This is unlike Palaeozoic ostracodes, which can usually be studied only as moulds and casts of the valves in the solid rocks in which they occur (see Steve Eckardt's articles referred to above). The

STUDYING VICTORIAN TERTIARY OSTRACODA (Cont.)



separated Tertiary valves may be photographed by the scanning electron microscope (see "The Scanning Electron Microscope and Palaeontology" by Jupp & Harbrow - "The Fossil Collector",Bulletin 35, September, 1991.

Methods and Preparation of Specimens

1. Collection of Samples. Although ostracodes can be obtained from limestones, mudstones and other sedimentary rocks, they are most easily separated from marls (calcareous clays). A fresh surface should be exposed to avoid contamination. For most fossiliferous deposits a 500gm sample is large enough to process, though more sparsely fossiliferous beds may require a 1kg sample. As with all samples collected in the field, they should be kept in sealed, heavy-duty plastic bags clearly labelled at the time of collection with all geographic and stratigraphic information.

2. Preparation of samples. Disaggregate the material by hand as much as possible. Cover with water to which a little water-softener ("Calgon") is added. Boil gently for 30 mins. to 1 hour, depending on the sample. Wash the material gently through a fine-mesh sieve (120 mesh; 125 microns is a good all-purpose size). Make sure the sieve is washed completely clean before adding the sample. Dry the residue either naturally or in an oven at no more than 100°C.

3. Picking the sample. Spread the dried residue on a picking-tray, and pick the individual ostracodes using a 000 artist's brush moistened with water, under a binocular microscope. They should be mounted as picked on a standard faunal micropalaeontological slide, usually with 20 or more divisions. The slide is coated with a water-soluble glue (gum tragacanth), so that the moistened brush is sufficient to mount the specimen in its appropriate place.

4. Cleaning specimens. In spite of the boiling of the sample, individual specimens often retain an infilling of matrix, or grains

FIGURE 1. (left)
A: Interior view of left valve of Neonesidea sp. [after van Morkhoven, 1962]
1, muscle scars; 2, inner lamella with radial pore canals; 3, hinge; 4, anterior (front); 5, posterior (rear) - arrow is used to indicate anterior direction.
B: Development of valves of Cytherella posterospinosa Hemig [after Hemig, 1966], from 5th instar (bottom of illustration) to adult or 9th instar (top two rows).
C: Left and right valves of Hermanites dameriacensis Keij [after Keij, 1958].
1, eye spot; 2, subcentral tubercle (muscles are attached inside); 3, caudal process (tail).

STUDYING VICTORIAN TERTIARY OSTRACODA (Cont.)

adhere to the surface of the valve. Careful use of the moistened brush, with a second brush to hold the specimen in place, is usually sufficient to clean the specimen. When the matrix is particularly stubborn, immersing the valves in hydrogen peroxide will generally loosen the grains. It is important to clean the interior of the valves, so that important characteristics such as muscle scars and hinge features can be seen.

Studying the Specimens

At first, it will be difficult to mount the specimens in any kind of order. With experience, it will be possible to mount what appear to be specimens of the same species in the one, or adjacent squares on the slide. However, the valves of ostracodes may reflect a range of characteristics which make it difficult for the beginner correctly to allocate them to a species ostracodes grow, but their valves do not - hence they moult a number of times between birth and maturity, and grow new, larger shells. Each moult is called an instar. There are normally eight instars before the mature adult stage, so you may find instars, as well as adult valves, and they will differ in size and appearance.

The difficulties do not end there. Many species of ostracode are sexually dimorphic - i.e., males look different from females (what's new!). The difference may be only one of size and shape, with males longer and less high than females; or it may be a difference in ornamentation of the shell; or the presence of brood chambers. Sexual dimorphism is not usually evident in instars. On top of all this, one must learn to recognise left and right valves of the same species. This a matter of orientation, since there is seldom any difference in ornamentation between the left and right valves. So one must know which is the "front" (anterior) and which is the "back" (posterior) of a valve, in order to decide whether it is left or right. These points are illustrated in the accompanying diagrams. An added problem is that some genera of Ostracoda, such as Xestoleberis and Argilloecia, are smooth surfaced, so that subtle differences in shape may be the only characteristics by which the micropalaeontologist (but not the biologist) can separate species one from another.

The use of the binocular microscope to study ostracodes is essential for the amateur, but an inexpensive instrument with magnifications up to x100 is adequate. Generally the valves can be studied effectively using reflected light. However, internal details

sometimes show up better if the valve is immersed in a drop of glycerine, and then viewed by transmitted light. The professional ostracodologist (the official title!) also uses photographs taken with the scanning electron microscope, since they reveal a wealth of detail which cannot be picked up with the optical microscope (see fig.2).

Resources Useful for the Study of Ostracodes

A list of references is given at the end of this article. For the study of Tertiary ostracodes, the standard taxonomic reference is still the appropriate volume of the "Treatise on Invertebrate Paleontology" (Part Q: Arthropoda 3: Crustacea) 1961. As with many volumes of the "Treatise", this one is being revised at present, but publication is still some time away, so that the 30-year-old original is the most comprehensive, though very out-of-date, treatment available. It is one reference to use when identifying to the level of genus. Another, which I found more

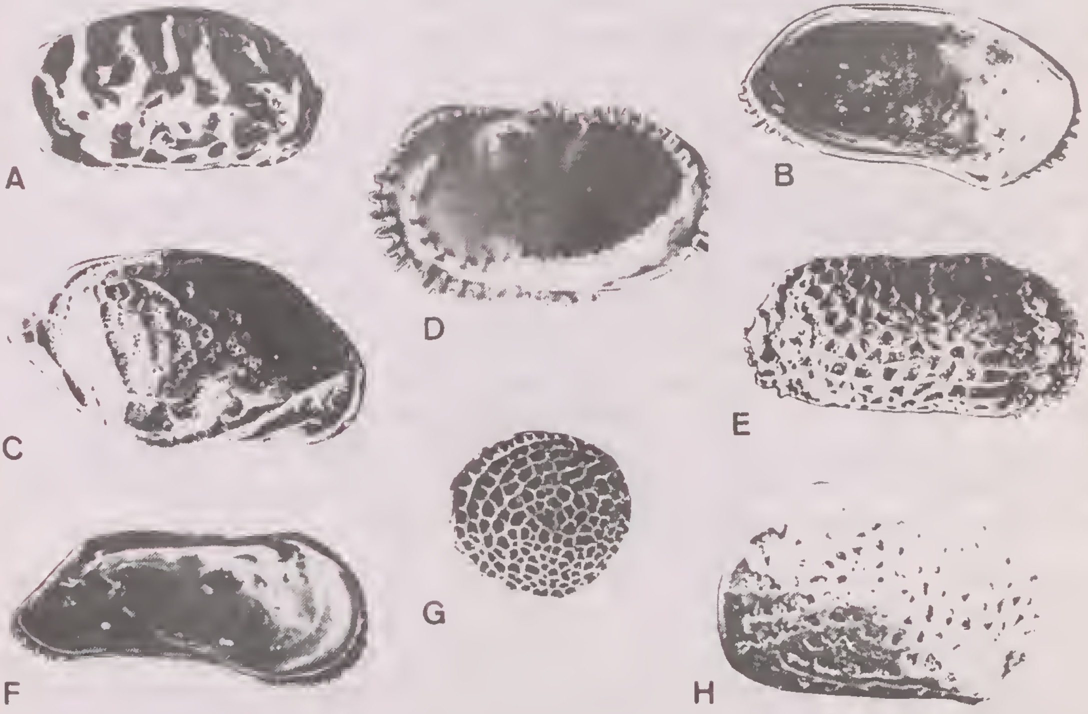


FIGURE 2.
SCANNING ELECTRON MICROGRAPHS: A, Callistocythere sp. LV x 120; B, Orlovibairdia sp. LV interior x 80; C, Oculocytheropteron sp. RV x 100; D, Miracythere sp. LV x 80; E, ? Dumontina sp. RV x 100; F, Deltaleberis sp. LV interior x 100; G, Polycope sp. x 120; H, new hemicytherid genus LV x 75.

STUDYING VICTORIAN TERTIARY OSTRACODA (Cont.)

useful, is out-of-print - "Post-Palaeozoic Ostracoda" by F.C.P.M van Morkhoven (2 volumes). At the level of species identification, as soon-to-be-published manual by Yassini & Jones, with numerous illustrations, will probably be the best, even though it is concerned with Recent, rather than fossil, forms. The separate papers listed below deal with limited groups, or even single species of fossil Ostracoda. Manuals which deal with micropalaeontology in general, and which cover a whole range of forms such as foraminifers, calcareous nanofossils, conodonts,radiolarians and diatoms, are also listed.

Victorian Tertiary Ostracoda

Marine deposits of Tertiary age occur along much of Victoria's coastline, and in inland areas which were covered by the waters of the Murray Gulf. Localities in which marls containing good faunas od Ostracoda occur include Muddy Creek, near Hamilton, various coastal exposures between Lorne and Geelong; Fossil Beach, Mornington and exposures of the Wuk Wuk Marl around the Gippsland Lakes.

Miocene species are often very distinctively ornamented, and quite beautiful (see illustrations), especially those belonging to the families Trachyleberididae and Hemicytheridae. These faunas lived in the shallow-water of near-shore and shelf environments, which also provided a home for a rich diversity of bivalve molluscs, gastropods, bryozoans and foraminiferans. More recent forms can be found in Pliocene-Pleistocene deposits at Portland, and in a variety of locations in the Melbourne Trough, as well as in Gippsland. Eocene-Oligocene and Pleistocene and Recent ostracodes are the subject of two recently-published papers by McKenzie, Reyment & Reyment (1990, 1991) in which a number of new genera and species are erected. New Miocene forms are the subject of a series of papers in preparation by the writer.

Conclusion

After publication elsewhere, details of new Miocene Ostracoda from Victoria will be given in later articles in the "Fossil Collector". The study of Ostracoda is a fascinating one, and the noted English micropalaeontologist and ostracodologist John Neale (no relation, but a good friend) highlighted this in his inaugural lecture as Professor of Micropalaeontology at the University of Hull). The lecture had the intriguing title "The Ostra-

coda - Religion, Sex and Mystery!" With characteristic humour, Neale drew the reference to religion from the common name of many ostracode genera Cythere, which is a Greek name for the Goddess of Love. He found ample material for the topic sex in the complex reproductive organs of the animal and its huge spermatazoa. The mystery lay in the strange evolutionary history of many genera, and the grotesque forms which many species adopt. I hope readers' interest in this group of tiny crustaceans is aroused by this introduction.

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SYDNEY'S GONE FISHING

Colin M. Chidley, P.O. Box 124, Merrylands, NSW, 2160.

An exciting new specimen of the genus Cleithrolepis has been found by Stephen Avery at a new Triassic locality here in Sydney. At the moment we do not wish to divulge the 'fishing hole' for we all know only too well what anglers are like!

The new specimen of Cleithrolepis, drawn by Stephen (see below), differs quite considerably in the head region and in the fins, from the typical Cleithrolepis granulatus (Egerton), from Gosford, NSW. It may well be classified as a new species some time in the future.

Would you believe Stephen found the head on one occasion and the tail within five minutes on the next visit.

Cleithrolepis sp. x 0.8

FOSSIL COLLECTING IN QUEENSLAND - CONTINUED

Robert Knezour, 25 Gibbon Street, East Ipswich, Queensland.

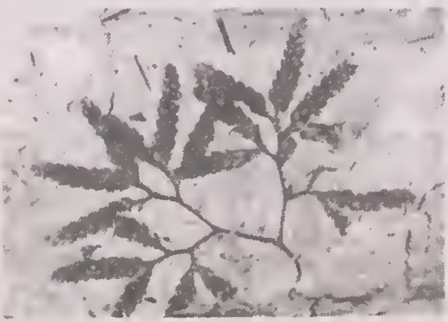
As F.C.A.A. members may recall, in Bulletin No. 34, I detailed finds from various fossil localities in the Brisbane - Ipswich area. This report is in the nature of an update on two of those sites at Dinmore, Ipswich. One site is in the Blackstone Formation, Brassall Subgroup, Ipswich Coal Measure, of Late Triassic age and the other, part of the Tertiary Redbank Plains Formation, is of tentative Palaeocene age.

Collecting at the Dinmore Triassic locality has been disrupted of late due to further excavations by the quarry owners, Claypave. Much material has been removed on the periphery of the fossil bearing strata and some fossiliferous material has been disturbed. It remains to be seen exactly how much of the site is to be excavated in the future.

Claypave are also working a section of the nearby clay pits and in doing so have uncovered a very rich Tertiary flora. As these two sites are only approx. 200 metres apart, it is easy to collect from both on one visit. It is frustrating to arrive and see more material has been removed, but without the initial excavations by the owners, the fossils would still be buried.

From the Triassic site, several finds are worth mentioning. The first is the conifer fructification referred to in my previous article. This has been donated to the Queensland Museum and a description is currently being made by Andrew Rozefelds at the University of Melbourne. A second partial cone, found later, has also been donated and forwarded to Andrew.

The second specimen is part and counterpart of the underside of a homopteran insect nymph. At first I thought it was a spider, but it has since been identified by Queensland Museum staff. After gloating over the find for a few weeks, the specimen was donated to Mary Wade at the Museum where a description will be undertaken.



Lygodium dinmorphyllum x 2.

Finally, a number of insect wings have also been found. These include three examples of Mesopsyche (Mecoptera - Scorpionflies), a hemipteran (Bug), a Triassoblatta (Cockroach) and a Mesogereon (Cicada).

FOSSIL COLLECTING IN QUEENSLAND - Continued

I am fortunate in being able to take specimens for identification to Dr. Kevin Lambkin, an expert on fossil insects. Kevin specialises in Neuroptera and Mecoptera but is also able to identify others to at least Order level.

The Tertiary locality has now become my main focus of attention, and while the drought in Queensland has been causing much hardship, it has proved a boon for collecting in a clay pit. Imagine a rectangle 4 metres wide by 25 metres long and 2 metres deep, that is the area being excavated.

The clay material is brittle but splits horizontally when dry although large complete specimens are hard to find. There are layers of mainly Dicotyledenous leaf impressions of many species, two species of fern, some conifer material, as well as numerous fructifications, seeds and so on.

I have searched for descriptions of the Dinmore Tertiary flora, but it seems few people have ever studied the fossils from this locality or described the species to be found there. This is a great pity as I understand good material has been available from the site, at intervals, for many years.

One of the Fern species found at Dinmore has, however, been described. This is *Lygodium skottsbergii* (Halle 1940), typically a large, trilobate pinna, and the associated fructification *Lygodium dinmorphyllum* (Churchill 1969), fertile pinnules bearing sporangia. The Churchill paper is very enlightening and mentions forty extant species, one of which, *Lygodium articulatum* from New Zealand, appears very similar to the species found at Dinmore. Andrew Rozefelds has recently submitted a paper on *Lygodium* to the Queensland Museum which I look forward to reading. I have found two small incomplete pinnules of *Lygodium skottsbergii* with the fructification *Lygodium dinmorphyllum* attached. While not exactly common, both species of *Lygodium* are regular finds.

Regarding the dicotyledenous leaf impressions, fruits and seeds. On advice from Andrew Rozefelds I contacted Professor Trevor Clifford and Mary Dettmann from the Botany Department of the University of Queensland at St.Lucia, Brisbane. They consented to view the collection and were very helpful. An attempt was not made, however, to identify the numerous species. I was told that since nobody has described this type of material, there are no references with which to compare them.

FIGURE 1.
Unidentified leaves from the Tertiary Redbank Plains Formation, of tentative Palaeocene age, Dinmore, Queensland (x 0.65 approx.). Drawings by Christine Webb

FOSSIL COLLECTING IN QUEENSLAND — Continued

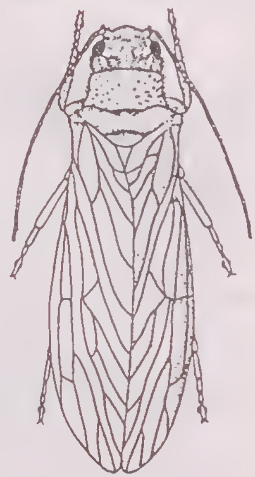
It is generally recognised that the Australian fossil Tertiary plant record is long overdue for study, but the amount of work needed to collate that material is probably one of the reasons why this has not been successfully accomplished, as yet.

Over the years the site has yielded a small number of insect wings (Riek, 1952). They are difficult to spot amongst the numerous leaf venations and I have been fooled on one occasion by the similarity of one to the other. Most are small fragments and easily overlooked. They are hard enough to find even when one is looking specifically for them, so imagine how easily important insect material can be discarded by those unaware of their presence and seeking only the readily available plant material. I would strongly urge other visitors to the site to examine the material very carefully. A hand lens is most useful for this purpose.

Among the Orders Kevin has identified from the site are Hemiptera (sub-Order Heteroptera) - bugs; Neuroptera - lacewings,dobsonflies and related forms; Mecoptera - scorpionflies; Odonata - dragonflies and damselflies and Coleoptera - beetles. Most of these finds are fragmentary and further description would be difficult.

The best find so far was actually made by a friend, Lane Morahan, who asked to accompany me on a trip to the site and promptly found part and counterpart of an insect wing by knocking two pieces of clay together!! The specimen was identified by Dr. Lambkin as the wing of an Alderfly, Order Neuroptera, Sub-Order Megaloptera,Family Sialidae.

Dr. Lambkin has asked to publish a record of the find as the fossil history of this group is poor. A new species cannot be recorded as the specimen is incomplete and could belong to either of the two extant species living in Australia. After description the specimens will be lodged in the Queensland Museum.



Extant Alderfly, Sialis mohri (from Frison 1937)

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FOSSIL INSECT LARVAE FROM THE LOWER TERTIARY REDBANK PLAINS SITE, SOUTHEAST QUEENSLAND.

Alan Rix, 118 Arnold Street, Holland Park, QLD. 4121.

Earlier reports on recent finds from Redbank Plains near Brisbane (Rix, 1990, Knezour, 1990) mentioned the presence of fossil insects. Indeed the site is well-known for its insect fauna, along with the Tertiary site at Dinmore and the Triassic beds at Denmark Hill and Mt. Crosby in the Ipswich area. The Redbank Plains insects were first described at length by Riek (1952, 1954), but now we can report the first insect larvae from Redbank Plains, and thus the first insects clearly indigenous to the site.

Riek (1952) described two species of Mecoptera (scorpion flies), and one of Neuroptera (lacewings), previously also described by Tillyard (1916). A Homopteran (cicada) wing was also identified from the site by Tillyard (1923), while Riek (1954) described four species of Diptera (flies) from the crane fly and gnat families, and a possible muscid (bush fly). Elsewhere Riek (1970) summarises the Redbank Plains insect fauna as "predominantly Homoptera and Coleoptera, with a few Blattodea, Hemiptera-Heteroptera, Neuroptera, Mecoptera and Diptera". Unfortunately, Riek did not publish on the most common insect forms from Redbank Plains, Homoptera and Coleoptera (beetles), and those orders remain undescribed.

FOSSIL INSECT LARVAE (Cont.)

Recent collecting has provided many new beetle specimens, beetle elytra, a variety of insect wings, mainly small, and many other insect-like fragments which are at this stage unidentifiable. Numerous ostracods are also present. The beetle specimens are all external moulds, but highly detailed including punctations in the elytra and body carapace. Size is normally no more than 10mm, and microscopic examination shows the face of the mould to be lined with minute crystals (probably of limonite, an iron mineral). Given the frequency with which insect material is to be found, the insects at this locality in Eocene times were clearly abundant, further evidence of a highly varied and plentiful fauna. Fossils of specialised insect predators such as small amphibians and spiders have, however, yet to be found.

The insect larvae recently discovered are the first recorded from the site. Insect larvae are frequently found as fossils, those from the Lower Cretaceous Koonwarra Fossil Bed in Victoria being the best-known in Australia (Jell and Duncan, 1986). Eocene insect larvae are most numerous in the Green River Formation in Wyoming in the United States, where "dipterous larvae...occur by the millions in extensive beds" (Grande, 1980, p. 242). Riek has referred to chironomid Dipteran larvae from the Tertiary deposits at Vegetable Creek in northern NSW, fossils originally described by Etheridge and Olliff (1890) as being larvae of a lampyrid beetle.

The new specimens from Redbank Plains include maybe a dozen larvae in a small group, average length 5-10 mm. The sclerotised head regions have left impressions in the rock from which it is difficult to ascertain detail (as they are lined with crystals as noted above). The abdomen and tail are clear, especially the tail, as the soft tissue of the abdomen has left only a shiny film on the rock. There is no body segmentation evident, although folds of tissue can be made out. The larvae were identified by the Queensland Museum as likely to be dipteran. A separate specimen contains fine detail of numerous hairs in the tail region, but its other body parts are unable to be clearly identified.

These larvae await formal entomological description, along with the other insect material now available from Redbank Plains, notably Coleopteran specimens.

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A NEW VERTEBRATE FAUNA FROM CLIFTON, SOUTHEAST QUEENSLAND - A PRELIMINARY REPORT

Ian Sobbe, M.S. 422 Clifton, Queensland, 4361.

The eastern Darling Downs has a very long history of vertebrate palaeontology with the earliest collection records being those of Leichardt 1847 and Stutchbury 1853, 1854.

A vast majority of fossiliferous localities are fluviatile in origin with specimens occurring as isolated skeletal elements. As a result, articulate specimens are extremely rare or totally absent in many localities. A new locality near Clifton is unusual in that it has produced a number of articulate specimens and a larger number of closely associated specimens which, when prepared, may be reconstructable to articulate specimens.

The new locality was discovered by Peter Pearce (Dept. of Primary Industry Soil and Water Conservation Branch) during surveying for erosion control structure in July, 1990. Late in the afternoon of July 14th, Peter arrived at the authors house bearing an unusually large smile and announced that he had found a skull and other bones in a gully close to where he had been surveying contours. Peter produced a molar tooth which he had unceremoniously plucked from the skull for identification purposes. This was immediately recognisable as belonging to a diprotodon _Diprotodon optatum_. Plans were quickly made to visit the site the following morning so as to attempt the recovery of these specimens. At this stage, none of us could have foreseen the number, quality and rarity of the specimens that would eventually be recovered.

Peter and I arrived at the site early on Friday morning and quickly found that the specimens (a skull and limb bone) were in an advanced state of disintegration due to exposure to the elements. Some preliminary excavation work was carried out, but it soon became apparent that better facilities and equipment would be needed to collect such poorly preserved material.

Following a phone call to Dr. Don McKenzie, arrangements were made for a team from the Queensland Museum to visit the site the following day. Consolidation of the specimens was achieved using a plastic solution (PARALOID TM) which then allowed removal in a plaster of paris jacket. This technique provided a successful means of collection with only minimal additional damage to the

Investigation of secondary fossil bone occurrence downstream from the primary site - June, 1991.

Ian Sobbe plaster jacketing an articulated kangaroo foot at the primary site watched by Joanne Wilkinson, Queensland Museum, and Amy Louise Sobbe (Chief plaster mixer!) - June, 1991.

A NEW VERTEBRATE FAUNA FROM CLIFTON (Cont.)

specimens. During these excavations a further series of specimens were encountered with further trips being made to the site on Sunday and the following Thursday. Additional fossils continued to be uncovered at an unprecedented rate including a further skull, three pairs of mandibles and a number of articulate specimens. This was clearly a major bone accumulation site with a strong likelihood that the specimens derived from a very small number of individuals.

Collecting trips have continued to the present, as time and resources allowed, with a considerable number of specimens being recovered. Most recently a backhoe, supplied by the courtesy of the Clifton Shire Council, was used to remove overburden from adjacent areas in an attempt to aid recovery of further material and, if possible, delineate the size of the deposit. Unfortunately only minimal numbers of specimens were recovered in subsequent digging.

In addition to the primary site, specimens have also been recovered from a number of secondary "in situ" localities as well as from "gravel beds" formed following erosion of gully sediments.

Specimen Preservation

Fossils at the primary site are preserved in a brown montmorillonite clay extending through a vertical interval of approximately 600mm, at a depth of approximately 4 metres from the present soil surface. A heavily cemented layer of gravel of about 100mm in thickness occurs immediately below the fossiliferous clay layer. Other fossil sites occur from a slightly higher horizon, through to approximately 1.5 metres below the main bed, over at least a 500 metre section of the gully.

All soils are rich in calcium carbonate which occurs as free nodules, sheets on soil fracture planes and as a concretionary layer up to approximately 3mm in thickness encrusting fossils. In contrast with other eastern Darling Downs localities, fresh water shells are almost entirely absent, indicating this site did not have permanent water. Local heavy runoff deposited approximately 100 bones in an elliptically shaped area 6-7 metres long by 3 metres at its widest point. The bones are very complete with very few partial or deposition damaged specimens being found. This, plus the frequency of articulate specimens would indicate only minimum fluvial transport distances prior to deposition.

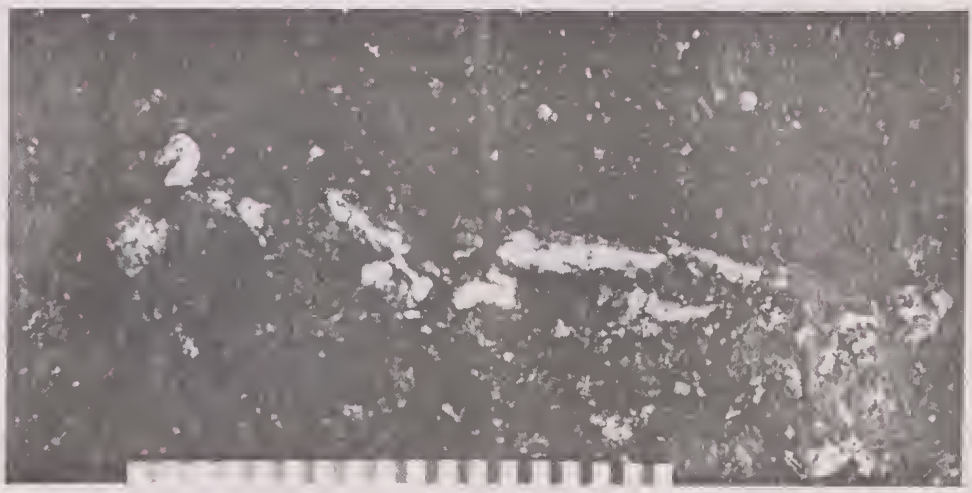
Collecting

Collecting at this site presented several difficulties :

(1) increasing depths of overburden as the deposit was followed into the gully bank;
(2) extreme softness and fragility of most specimens; and
(3) large plaster jackets were difficult to remove from the steep sided gully due to weight, some requiring the use of a crane truck.

Overburden was removed using basic tools such as forks and shovels, with a backhoe being used in the final stages as overburden depths became greater. Heavy bladed knives were used for removal of clay areas between fossils. Once a fossil was encountered, work continued at a much slower pace using knives plus dental tools for finer work, particularly the removal of carbonate encrustations.

All bones were extremely soft, generally shattered from movement of the enclosing clays (montmorillonite clays often have 20% linear shrinkage), but intact due to protection by the carbonate encrustation. Once a bone was fully delineated, its vertical and horizontal position was plotted for future reference. Consolidation of the soft bone was accomplished using an acetone based solution of the plastic PARALOID. Acetone being miscible with water allowed use of the consolidant whether the bone was wet



Articulated fossil kangaroo foot, partially excavated and consolidated with solution of plastic 'Paraloid', prior to plaster jacketing. Scale in centimetres.

A NEW VERTEBRATE FAUNA FROM CLIFTON (Cont.)

or dry. This solution was generally applied progressively as carbonate was removed or major cracks were encountered. Once consolidation was completed, the specimen was prepared for plaster jacketing before removal. This is accomplished by covering the bone in layers of wet paper followed by hessian strips soaked in plaster of paris. These jackets may contain one or any number of bones depending on the degree of overlap and ease of separation in the field.

Faunal List

Many of the plaster jackets have yet to be opened and prepared, so obviously some surprises may yet await us. The following is a brief outline of specimens that are so far confirmed from both the primary and secondary sites :-

Diprotodon optatum: By far the majority of bones recovered belong to this large diprotodontid. Two skulls, three pair of mandibles and a large number of post cranial elements have been recovered. Some are articulate, e.g., one complete shoulder region, and may all originate from a very small number of individuals. Secondary sites have also produced a range of lesser specimens.

Macropods: One (as yet unprepared) hopefully near complete kangaroo skeleton has been recovered. Generic identification will not be possible until preparations are complete. Secondary sites have produced a range of species including Macropus, Protemnodon and Procoptodon, plus an articulate series of lumbar vertebra and attached pelvis of an exceptionally large kangaroo.

Wombats: Only isolated remains have been found at the primary site, but have been relatively more common at other secondary sites. Most appear to be from the common wombat (Vombatus urscinus); however, one near complete skull found loose in gravel wash shows an exceptionally high roof - further preparation is required before this feature can be fully accessed. Isolated elements of larger wombats, probably Phascolonus gigas and Phascolomys medius are recorded.

Rodents: One rodent tooth and an accumulation of small bones (presumed to be rodent) was found at the primary site, but has not yet been prepared. This may represent a partial skeleton.

Thylacoleo carnifex: A partial upper incisor (I) is the only

direct evidence for a Thylacoleonid. Bone fragments show numerous tooth marks assignable to Thylacoleo.

The Future

A priority for the future study of this deposit is the preparation of all specimens collected thus far. Continued surveillance of the site will hopefully increase the number of specimens available for study and the diversity of species represented in the collection.

Our present knowledge of the age, stratigraphy, sedimentology and taphonomy of this area is poor. Current studies should refine our knowledge in these areas, however, the high cost of C14 and other age estimation procedures may limit some research.

Acknowledgements

Many thanks are expressed to the following people:-

Peter Pearce for finding, and more importantly, reporting the locality; the property owners, John and Gail for access to the site and continuing support throughout the project; Clifton Shire Council for the provision of earthmoving machinery; staff of the Queensland Museum, Don, Joanne, Laurie, Paul and Ralph; and other friends for their work throughout this project.

FOSSIL GINKGO FROM QUEENSLAND

Part and counterpart of the Triassic ginkgo Ginkgoites simmondsi (Shirley) from the Blackstone Formation, Dinmore, S.E. Queensland. The specimen is 190mm across and has 38 segments. Photograph courtesy Lance Fitness, Deception Bay, Queensland.

BOOKS AND BOOK REVIEWS

RIVERSLEIGH - The Story of Animals in Ancient Rainforests of Inland Australia by Michael Archer, Suzanne J. Hand and Henk Godthelp. Published by Reed Books Pty., Ltd., Suite 3, 470 Sydney Road, Balgowlah, NSW 2093, Australia.

Recommended retail price A$39.95.

Riversleigh is a palaeontologist's dream come true. Within this remote cattle station, 200 kilometres north-west of Mount Isa, Queensland lies one of the most significant fossil deposits in the world. It is certainly the richest and most curious find ever discovered in Australia.

Remains of many thousands of weird and wonderful prehistoric animals have from the last 25 million years been superbly preserved in the limestone outcrops. The discoveries have already doubled the sum of our knowledge about Australia's unique fauna.

Amongst the ancient casts have been found marsupial lions, carnivorous kangaroos, marsupial diprotodonts, 7 metre long pythons, early ancestors of the now extinct Tasmanian tiger and primitive platypuses. The fossils confirm that here once was a tropical rainforest.

Michael Archer, Suzanne Hand and Henk Godthelp, the principal scientists on this remarkable excavation, have now written the definitive book on Riversleigh. They explain the changing scene since Australia broke away from the mighty continent of Gondwana and how animals afloat this raft evolved through the ages. They explain some of the unusual techniques used on a dig, how to recognise fossils, how to date them and how to reconstruct from them. Above all, the light and easy style of writing, the many colour photographs and beautifully executed artwork by Dorothy Dunphy, they bring to life the whole teeming world that once populated these now arid wastes.

In his foreword to this book Sir David Attenborough says "Only in one or two places on the surface of our planet, in the course of the last three thousand million years, have conditions been just right to preserve anything like a representative sample of the species living at any particular time. Those places are the rare treasure houses of palaeontology. Riversleigh is one of them."

Information from Reed Books P/L.

FOSSILS FROM THE SYDNEY BASIN compiled and published by NatScience, P.O. Box 124, Merrylands, NSW, 2160.

Price A$18.00 including postage in Australia.

(see separate advertisement p.37).

FOSSILS OF SOUTH AUSTRALIA - Part 1, Sea Urchins of the Murray River Cliffs by Tony Sadler, Neville S. Pledge and Beryl Morris. Published by Quoll Enterprises - August, 1983.

This useful field guide, reviewed in Bulletin 12, is still available from Quoll Enterprises, P.O. Box 48, Findon, South Australia, 5023, for A$8.00 including postage and packing.